MAUSER
OERLIKON

Safety, Reliability & Performance of the Ahead (ABM) Programmable Fuze System

NDIA 39th Annual Gun & Ammunition
Baltimore, MD Apr. 13-16, 2004

Presented by:
Allan Buckley
Director Product Management
Oerlikon Contraves Pyrotec AG
CH-8050 Zurich / Switzerland
www.mauseroerlikon.com
allan.buckley@ocag.ch

 P2 16512 AA, P-VP/FD/41, © 2004 Oerlikon Contraves Pyrotec AG, Zürich/Switzerland

MAUSER
OERLIKON

Ahead:

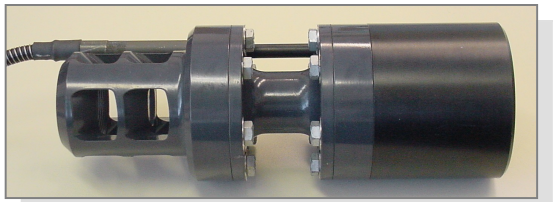
The AIR BURST Technology for Medium Calibre Ammunition

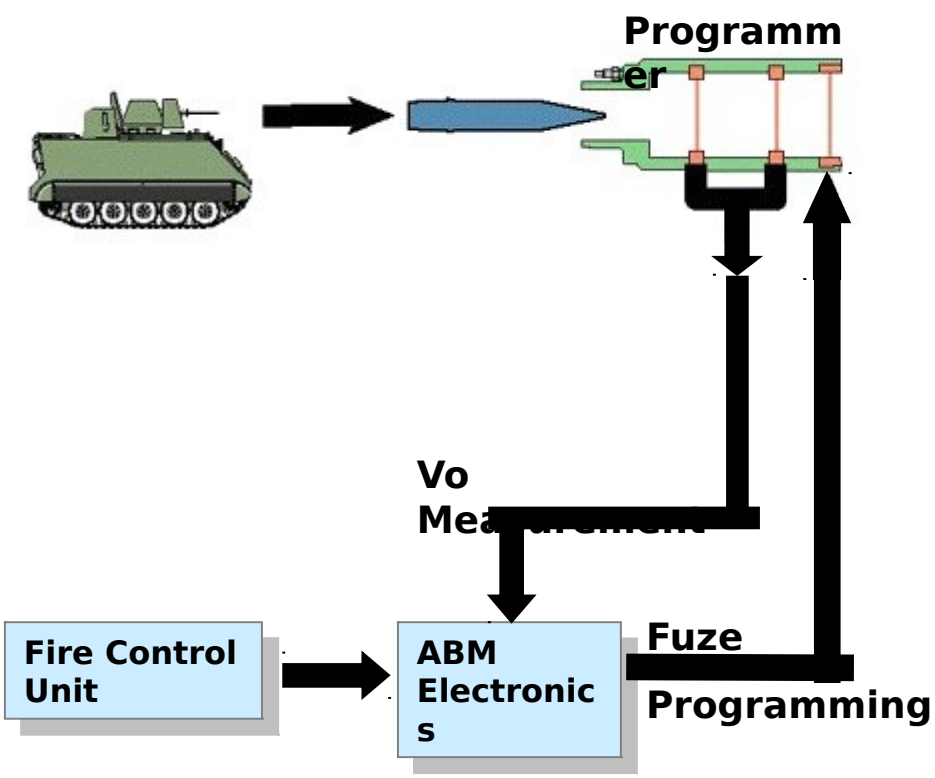
We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

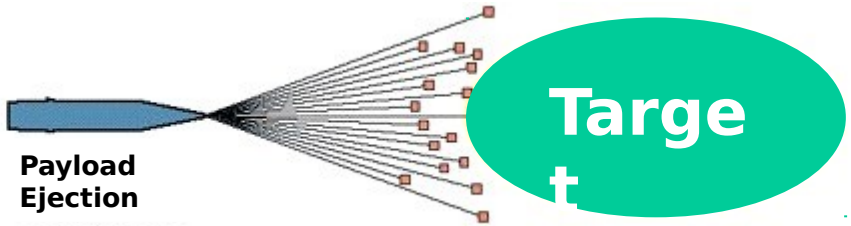
Ahead (ABM) for Air Defense and Vehicle Armament

MAUSER OERLIKON

Application IFV:





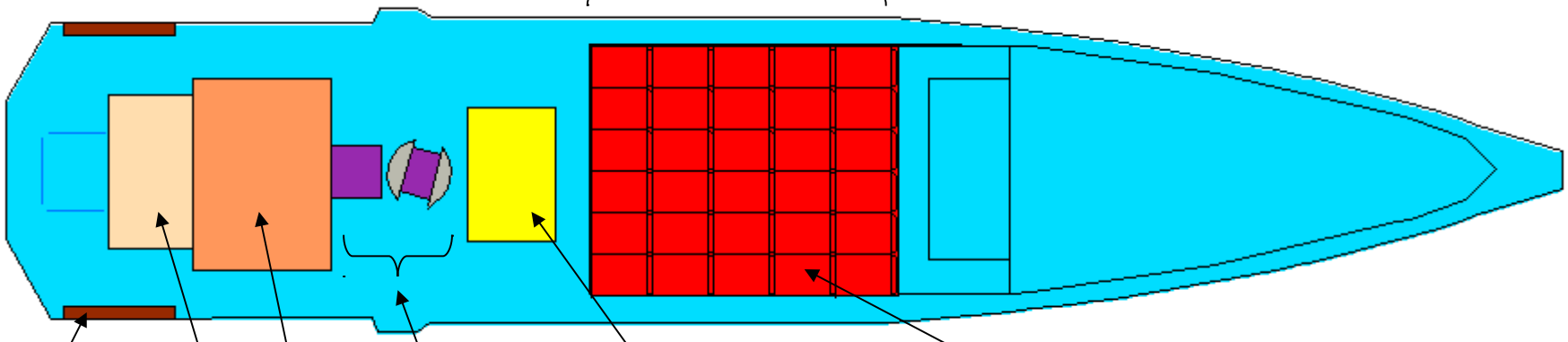


We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

P2 16512 AA, P-VP/FD/41, © 2004 Oerlikon Contraves Pyrotec AG, Zürich/Switzerland

Ahead (ABM) KETF Projectile Concept Outline

MAUSER OERLIKON



We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Ahead (ABM) Fuze Module

Ignition System / Squib

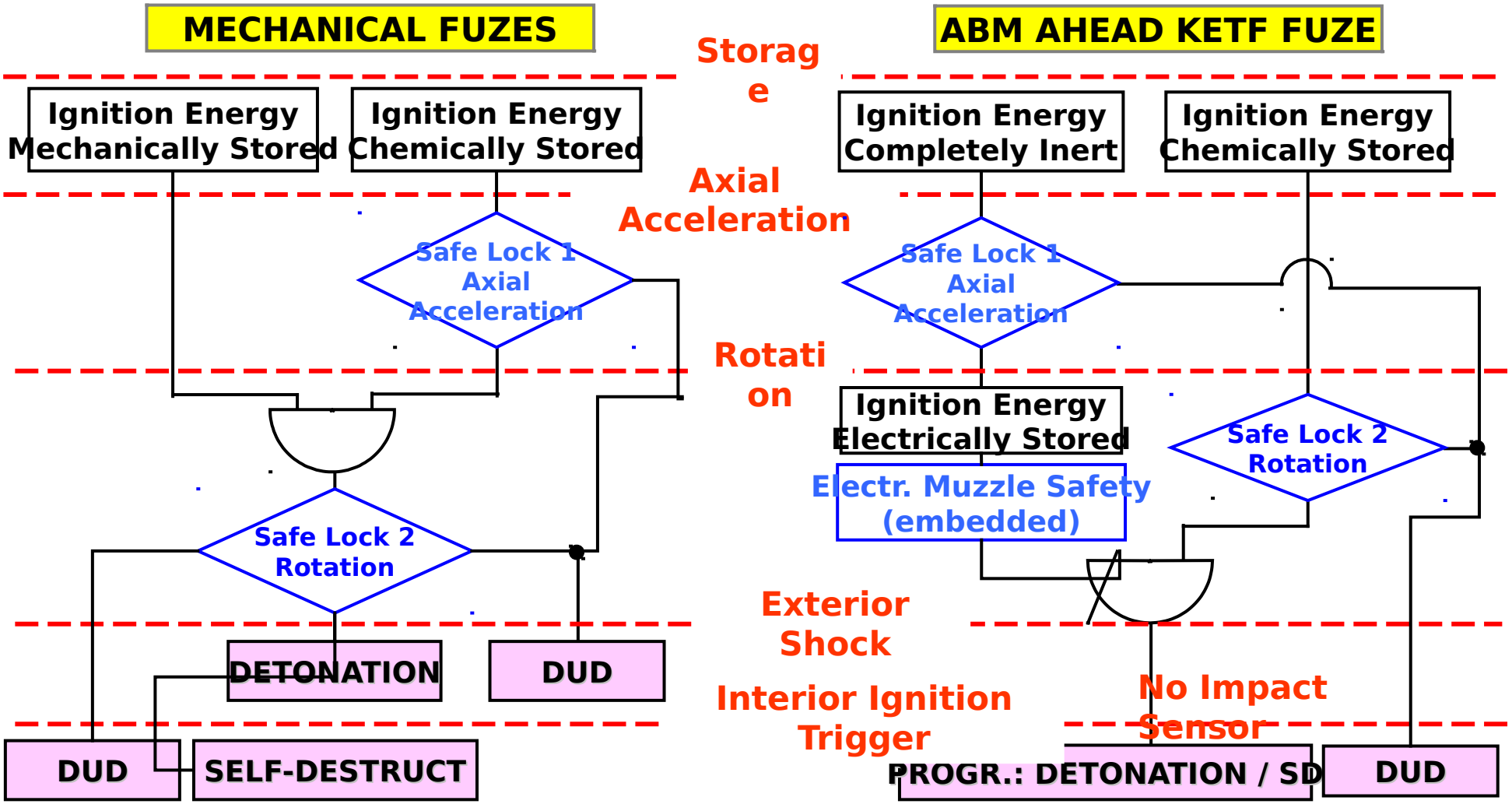
Electronic Timer Module / ET 1-11

Set-Back Generator

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

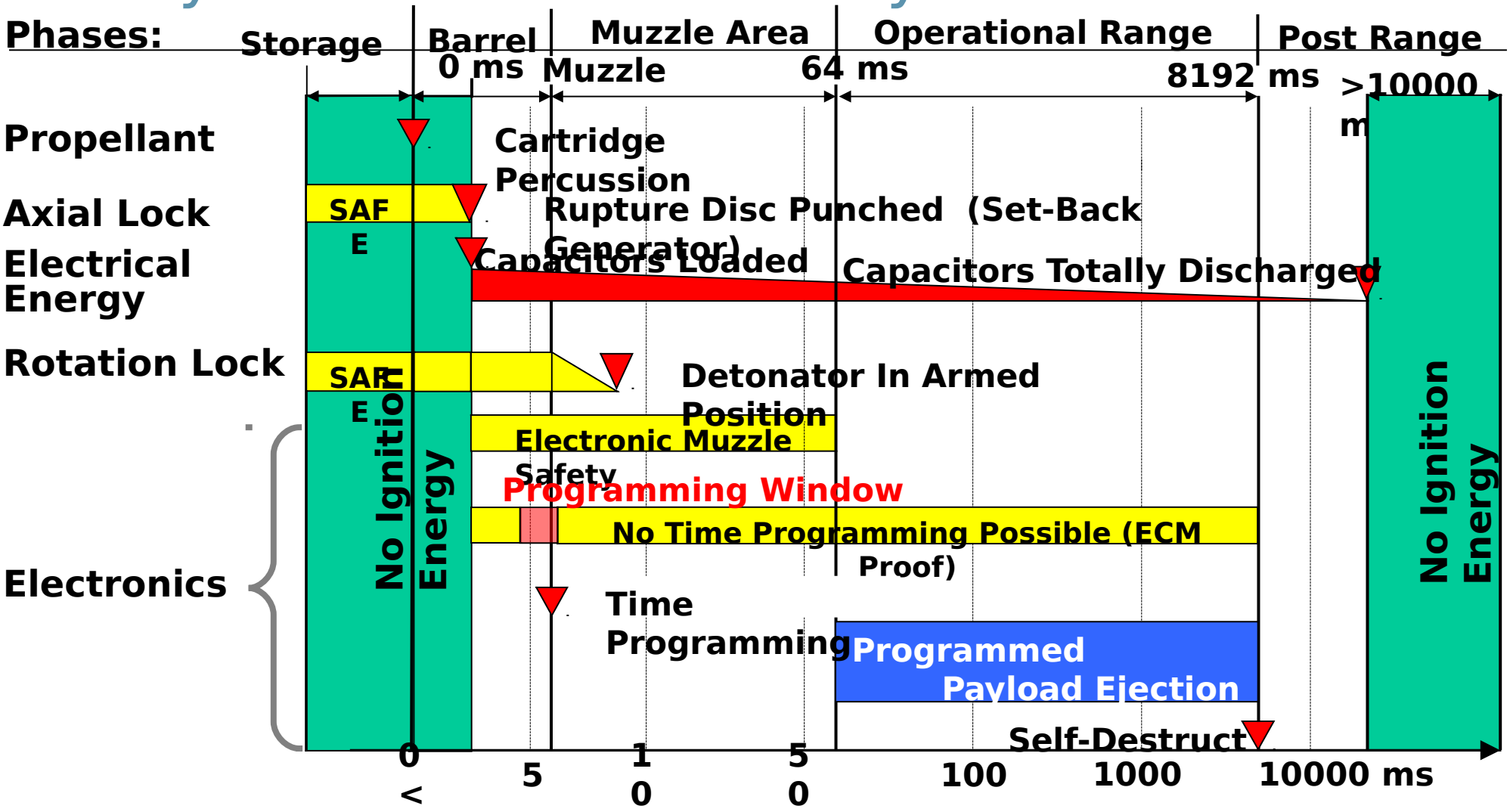
Safety Criteria for Ahead (ABM) KETF Fuze

MAUSER OERLIKON



We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Ahead (ABM) KETF Fuze: Life Cycle Events - Summary



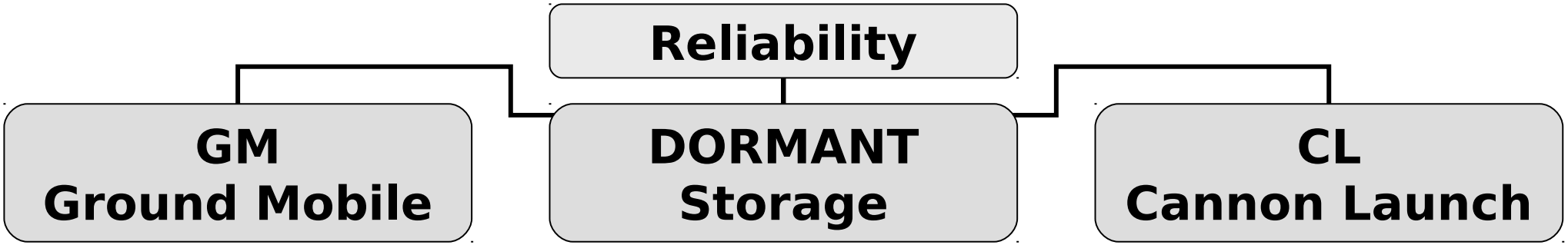
We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Ahead (ABM) System Function Reliability

MAUSER OERLIKON

Theoretical Reliability Prediction according:

MIL Handbooks 217F2 & 338



Results of ABM System Ahead Reliability:

In Theory > 97%

In Practice > 97%

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

35 mm Ahead (ABM) HETF Programmable Payload Delivery

MAUSER OERLIKON

Precise Time Space Payload Delivery up to 5000 rd/min!

10th Rd:
300 m

1st Rd:
1200 m

„String of Pearls“ at 550 rd/min of 35mm Ahead-HETF Ammo

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Compensation of the Muzzle Velocity Variation

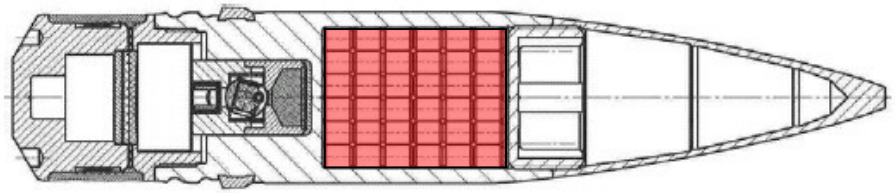
MAUSER OERLIKON

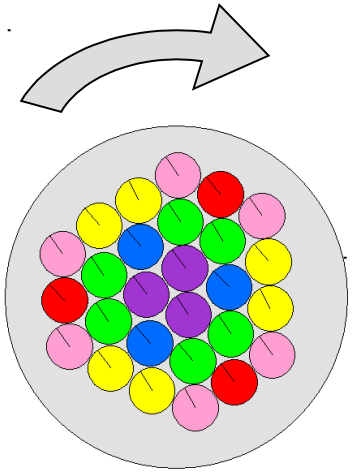
Burst of 7 Rounds 35mm Ahead-HETF Ammo at 1.6 km Range

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

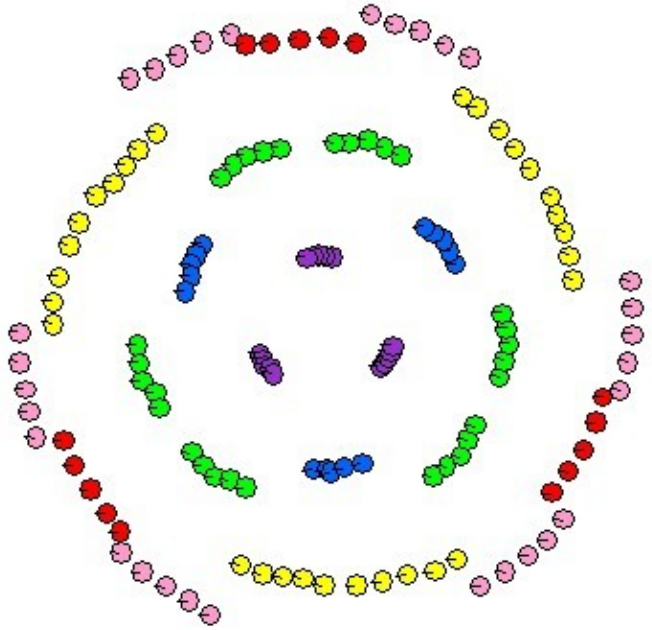
30mm x 173 Ahead (ABM) KETF Subprojectile Payload: Layout & Footprint

MAUSER OERLIKON

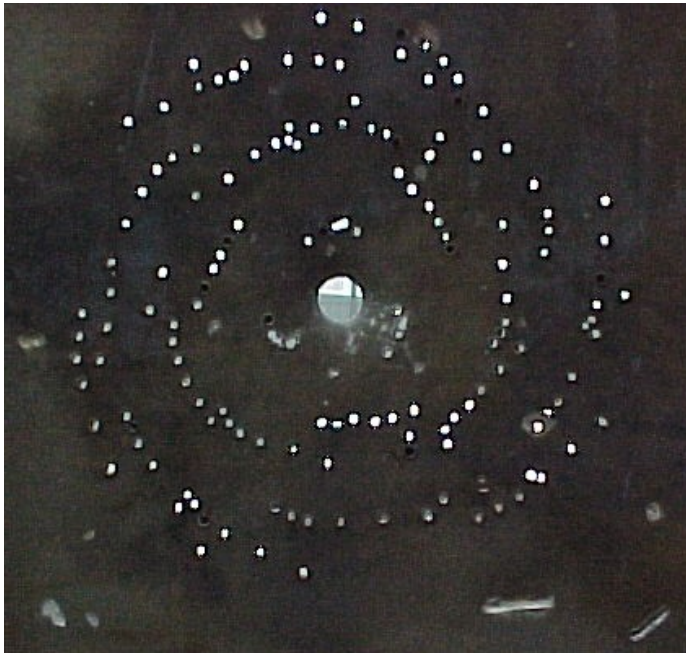




Layout of the 162 Subprojectiles SP (1.24 g each) 27 SP x 6 Layers



Version: 27 SP x 5 Layers (1.5 g) (Simulation after 500µs)

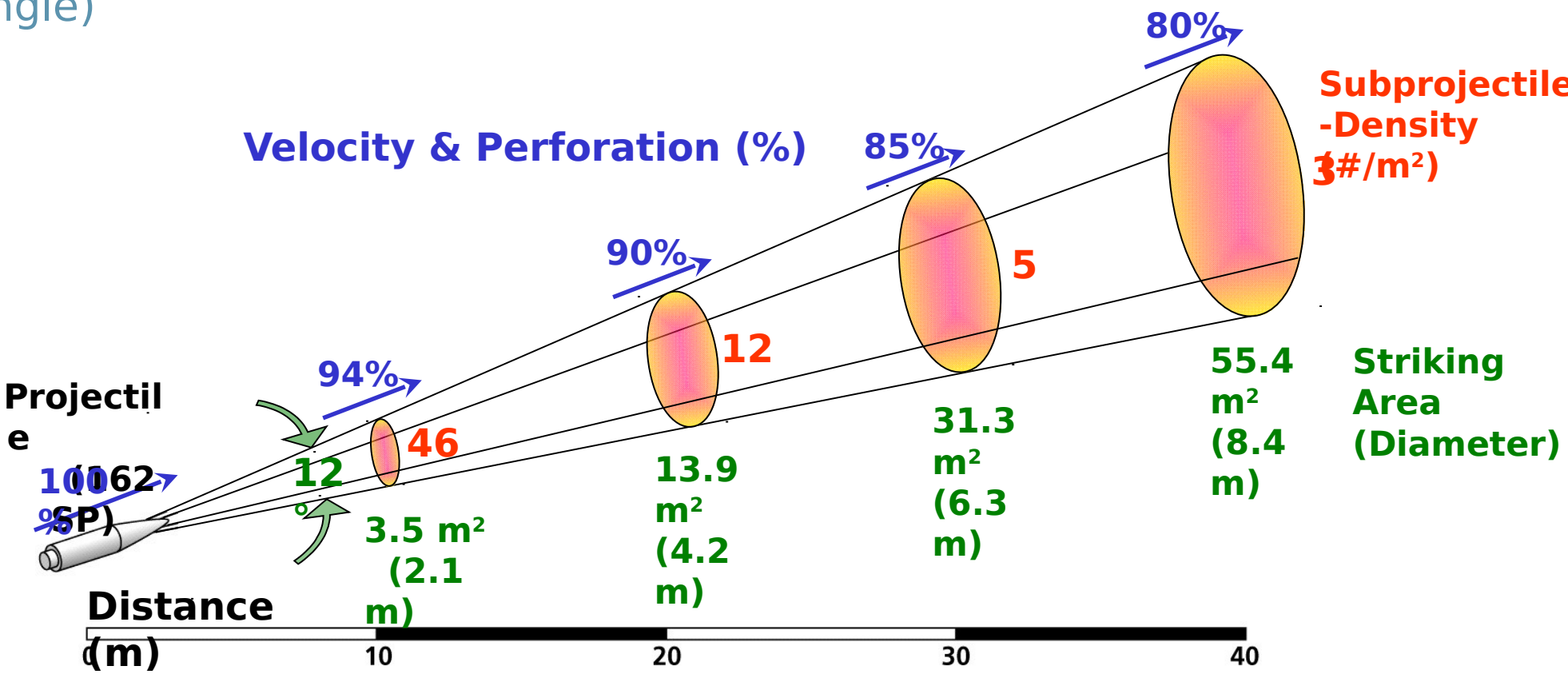


Payload-Footprint on 1 x 1 m Al -Plate after Ejection of the 162 SP (4 ms after ignition)

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

30mm x 173 Ahead (ABM) KETF Subprojectile Dynamic Parameter

Payload Ejection at 500 m Range (Cone of 12° Opening Angle)

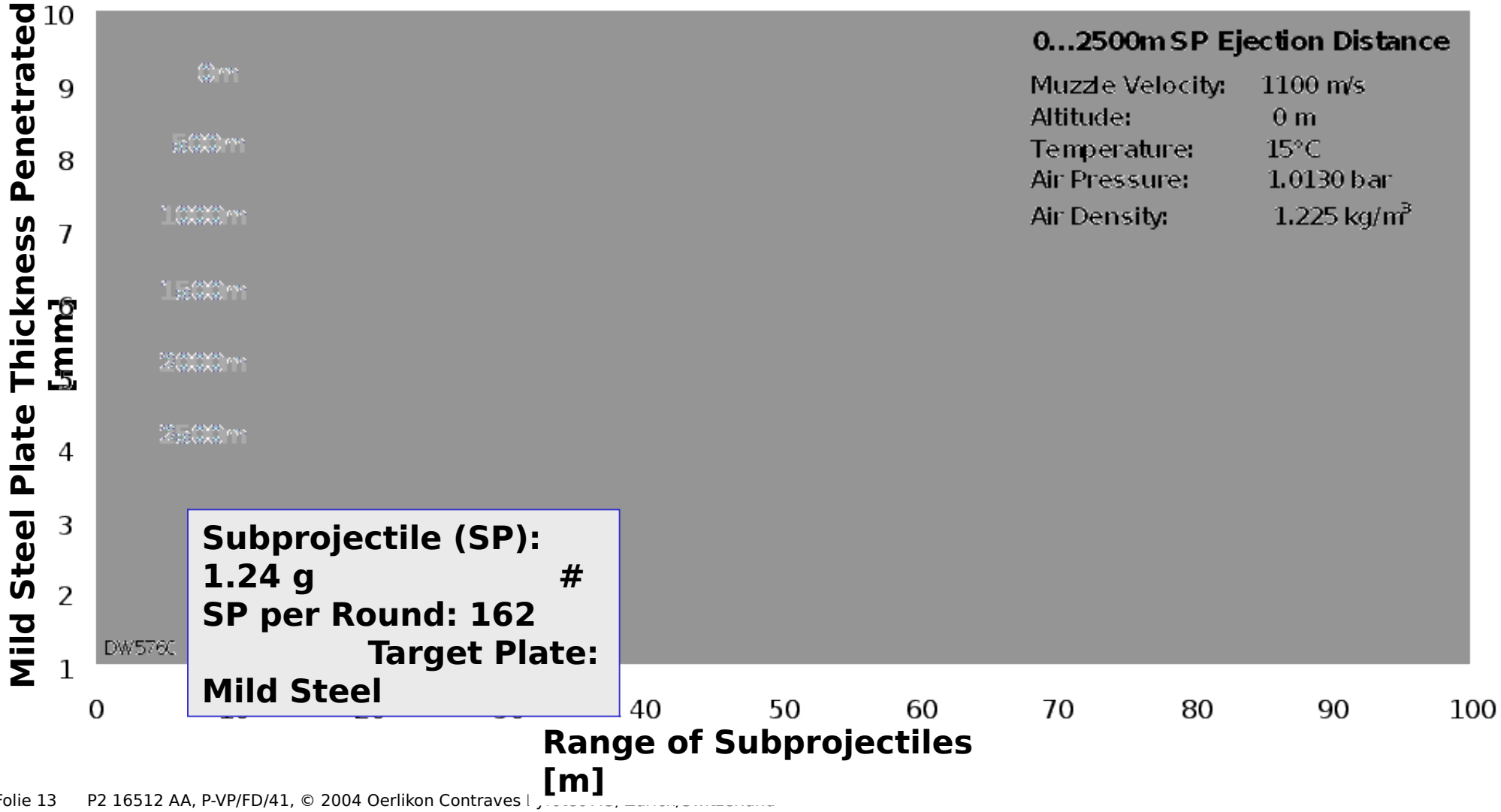


We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

F2 10138 CD

 P2 16512 AA, P-VP/FD/41, © 2004 Oerlikon Contraves Pyrotec AG, Zürich/Switzerland

30mm x 173 Ahead (ABM) KETF Subprojectile Penetration Capability



We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Burst
Effectiveness against ATGW-Bunker at 1 km

MAUSER OERLIKON

Notice: ATGW: **A**nti-**T**ank **G**uided **W**eapon

Results: Numerous Full Perforations / 100% Damage (Demo: Dec.1999)

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

30mm x 173 Ahead (ABM) KETF: 5 Round Burst against Squad of 7 - Target

MAUSER OERLIKON

Target: Squad of 7 (Field: 2 x 38m)

The video shows a 5 round burst fired to the target field (firing rate: 200 rd/min).

Distance between rounds: 9 m

Multiple perforations in each of the 7 target plates (2mm Fe):

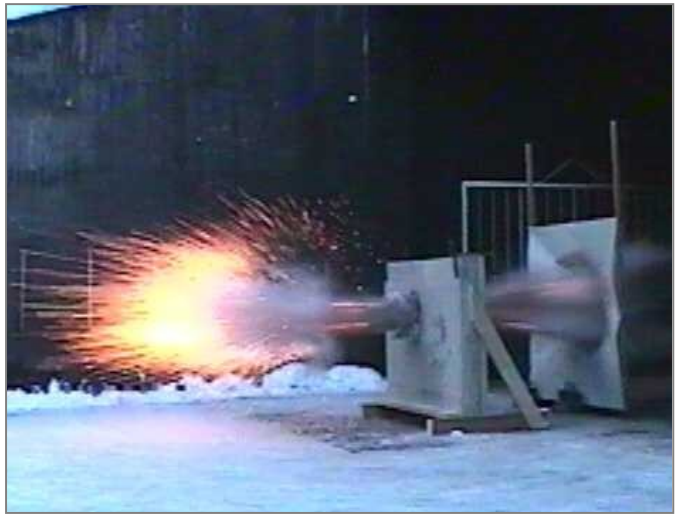
13 Perforations/m² on

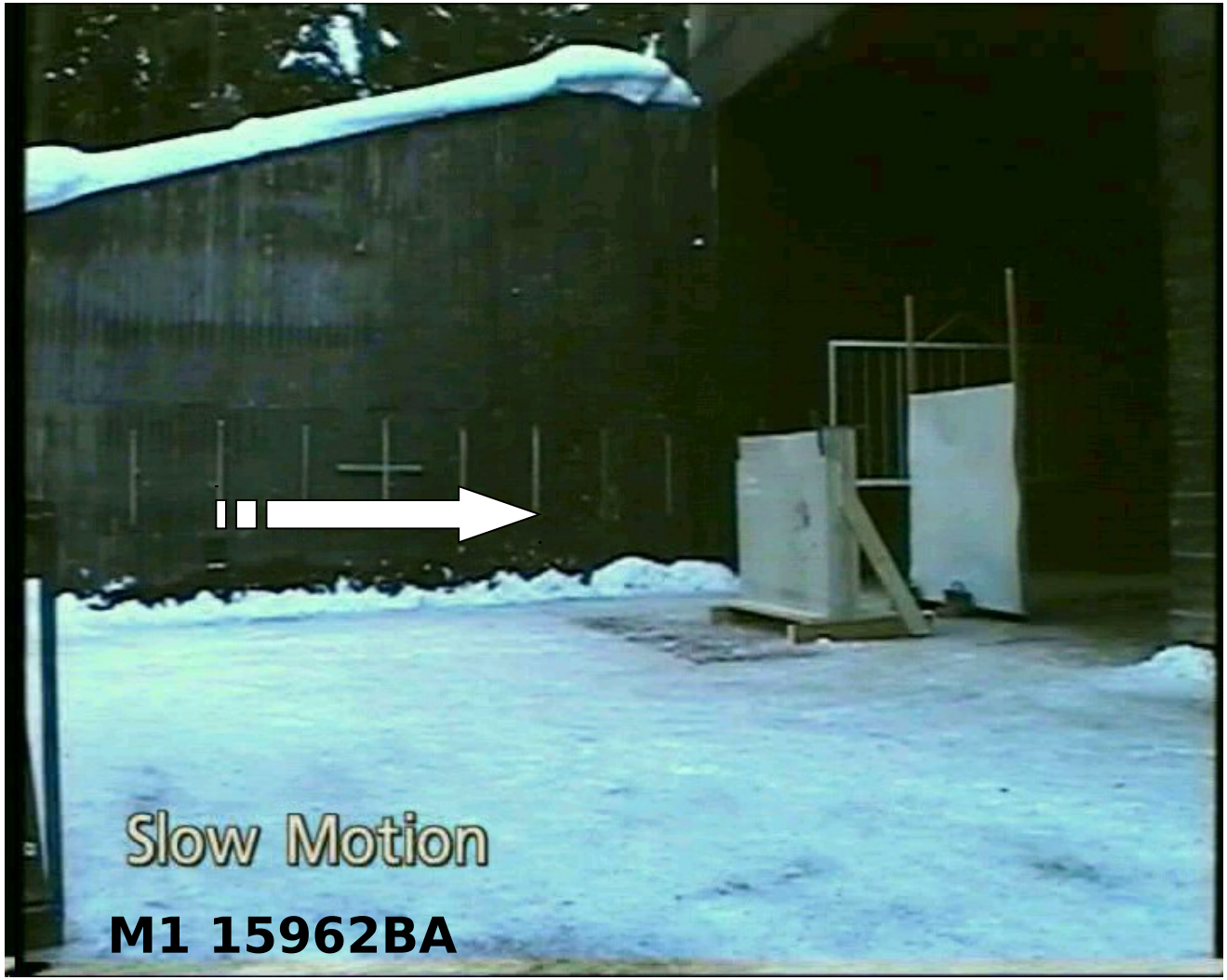
We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

P2 16512 AA, P-VP/FD/41, © 2004 Oerlikon Contraves Pyrotec AG, Zürich/Switzerland

30mm x 173 Ahead (ABM) KETF against Urban Target (Unprogrammed Fuze)

MAUSER OERLIKON





Target:

20 cm Concrete Wall with double Steel-Structure Reinforced

Range: 500 m

Results:

Target Fully Penetrated

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

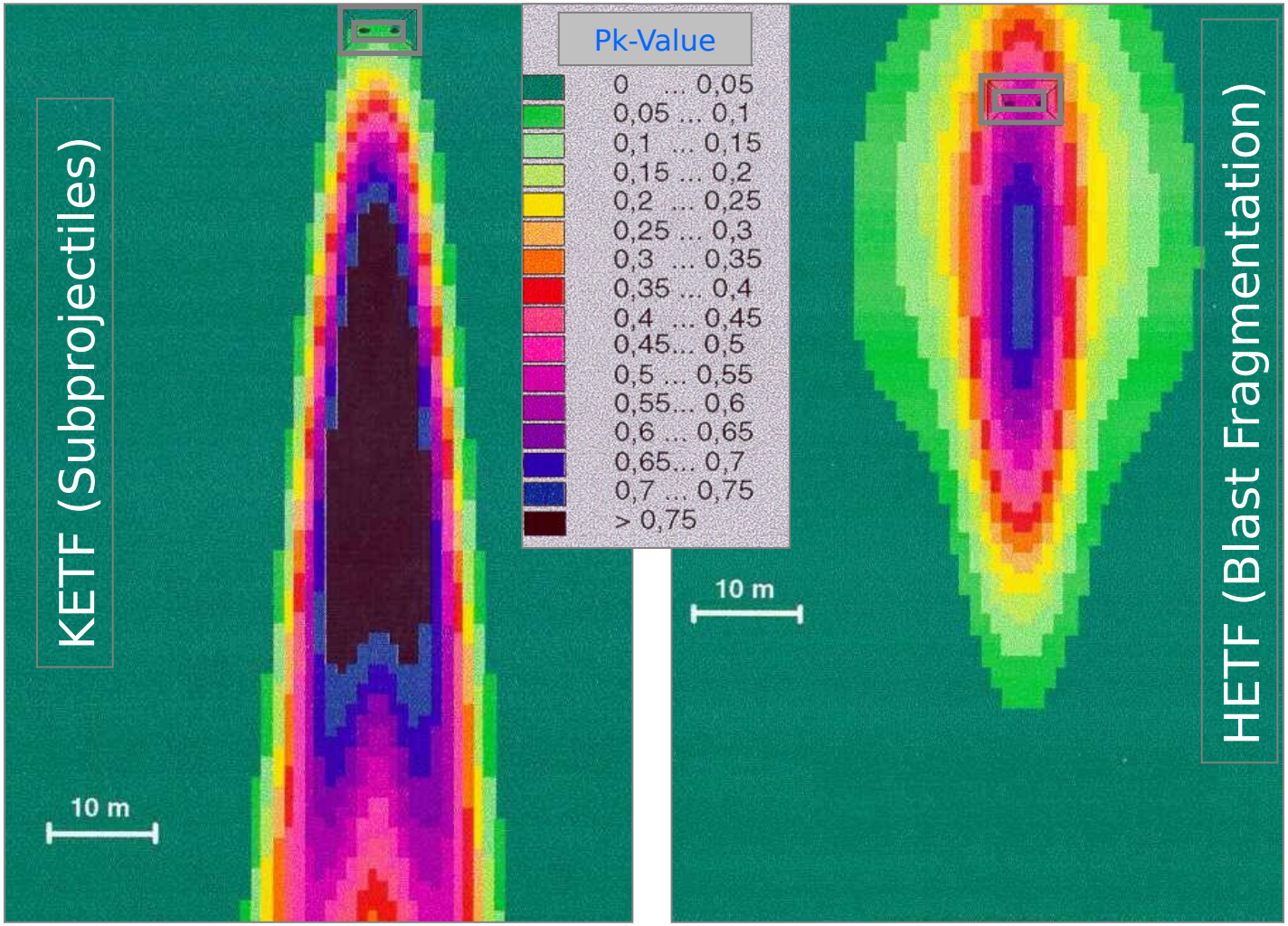
 P2 16512 AA, P-VP/FD/41, © 2004 Oerlikon Contraves Pyrotec AG, Zürich/Switzerland

35mm x 228 Ahead (ABM) KETF & HETF against ATGW-Bunker

MAUSER OERLIKON

Lethality of a

3 Rd Burst against an ATGW Bunker at 1500 m



We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Ahead (ABM) KETF:
Ahead Technology Main Safety Features

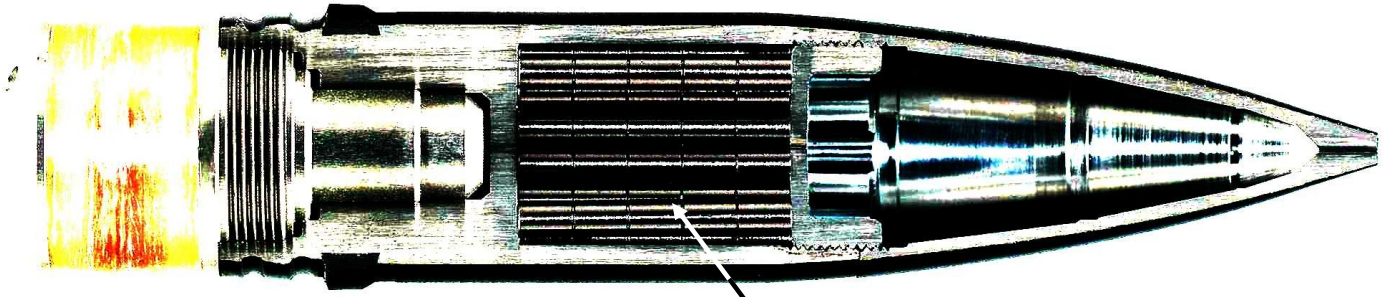
MAUSER OERLIKON

- Power Supply: Set Back Generator (Activation over 28‘000 g); i.e no Battery
- Full Gun Unload Safety
- Safe & Arm: Mechanical & Electronic
- Time Programming of less than 64 ms not accepted (Default: Self Destruct)
- Each Bit programmed with Double Pulse
- Completeness Check on 12 Bit Message (if negative: Self Destruct On!)
- If no fuze programming required or possible: automatically Self Destruct On
- No Impact Sensor in Fuze: firing through bushes & tree branches w/o burst
- Total HE content less than 0.6 g for 30mm

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

P2 16512 AA, P-VP/FD/41, © 2004 Oerlikon Contraves Pyrotec AG, Zürich/Switzerland

One Ahead (ABM) Fuze System - Two Different Warhead Configurations



30mm x 173

35mm x 228

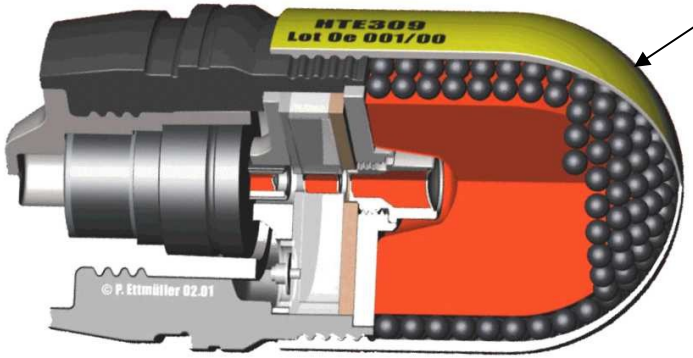
Subprojectile Warhead KETF

(Kinetic Energy Time Fuze)

Fuze

Blast Fragmentation Warhead HETF

(High Explosive Time Fuze)



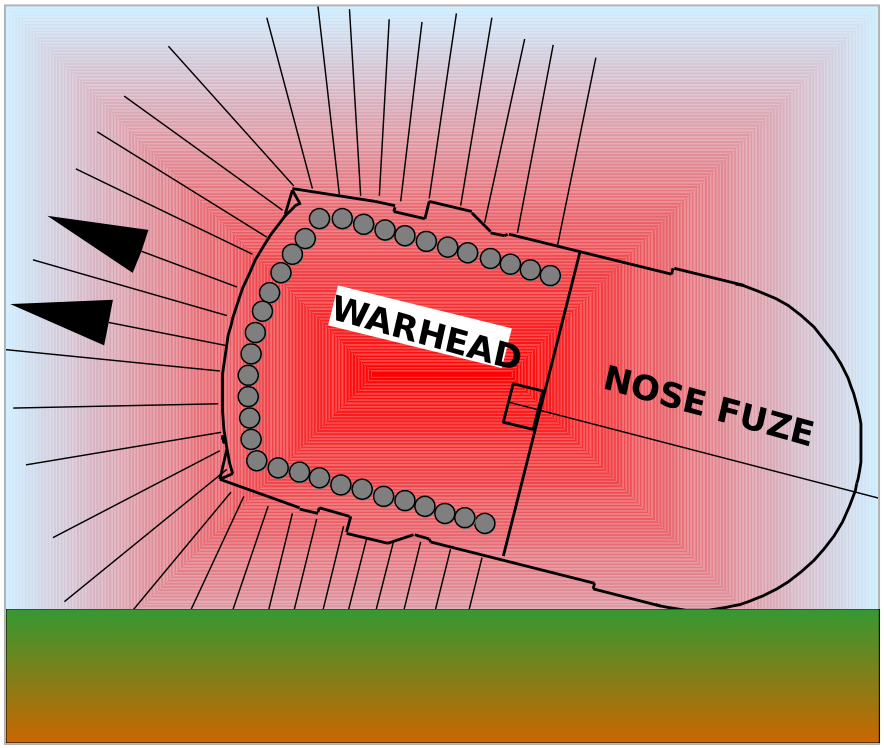
Scale:

40mm x 53

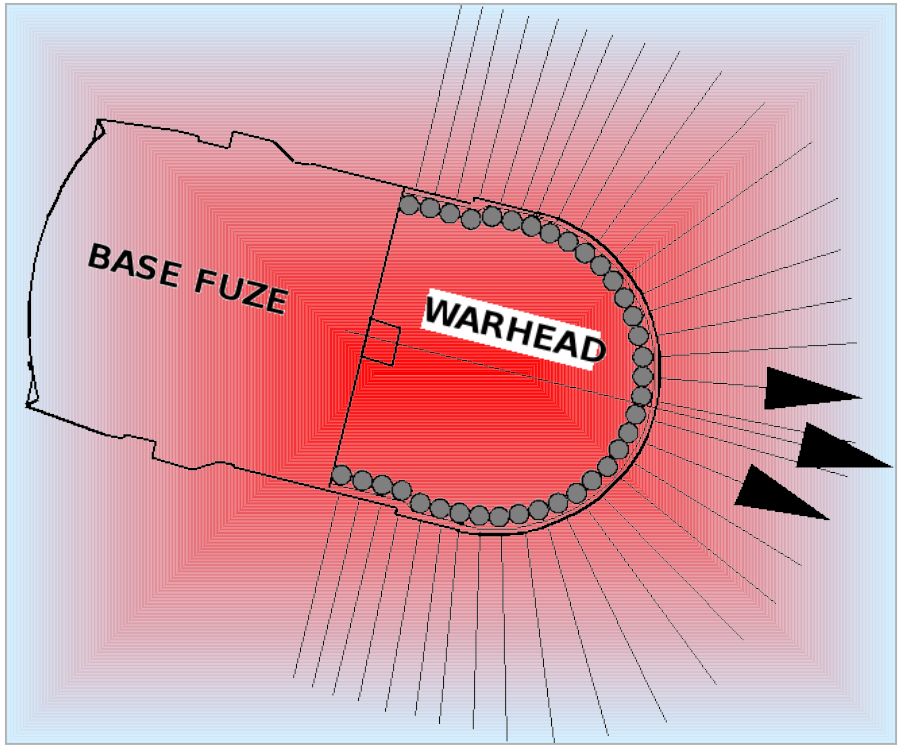
We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Ahead (ABM) HETF Basic Concept for 40mm x 53 Automatic Grenade Launcher AGL

MAUSER OERLIKON



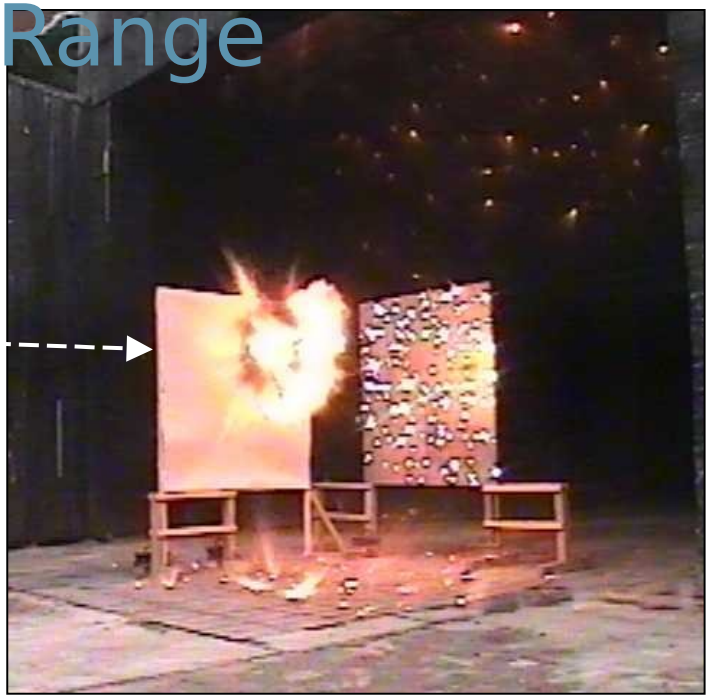
Conventional HE Round (PD-Fuze)

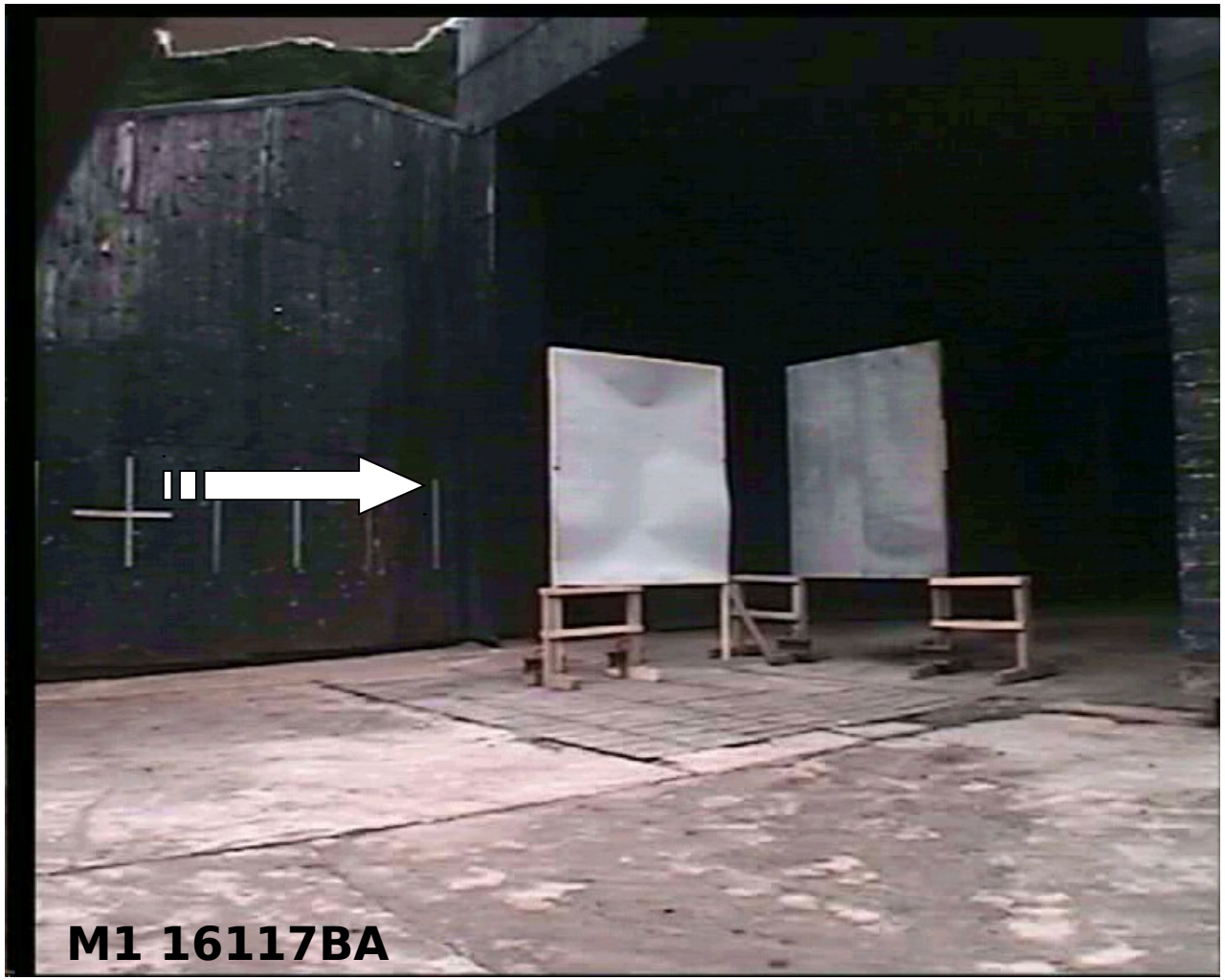


Optimum for Air Burst Munition

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

40 mm x 53 Ahead (ABM) HETF Firing Trials at 200 m & 1000 m Range





Remarks:

No fragments are flying backwards!

Firing Rate up to 570 rd/min (AGL-ST-Kinetics)

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

Ahead (ABM) System Milestones

- 1973 8 bit - transmission demonstrated on a 20 mm shell at muzzle exit (1st "Ahead-like" programming)
- 1992 35 mm Ahead - Ammunition: technical presentation to international ammo experts /OCP- Test Center
- 1996 NATO qualification of the Ahead system (Canada)
- 1999 Demonstration of ABM 30 mm x 173 prototype
- 2000 Demonstration of ABM 40 mm x 53 prototype for AGL
- End 2003 - 35 mm Ahead ABM Systems fielded in 8 countries.

In evaluation / procurement in several others.

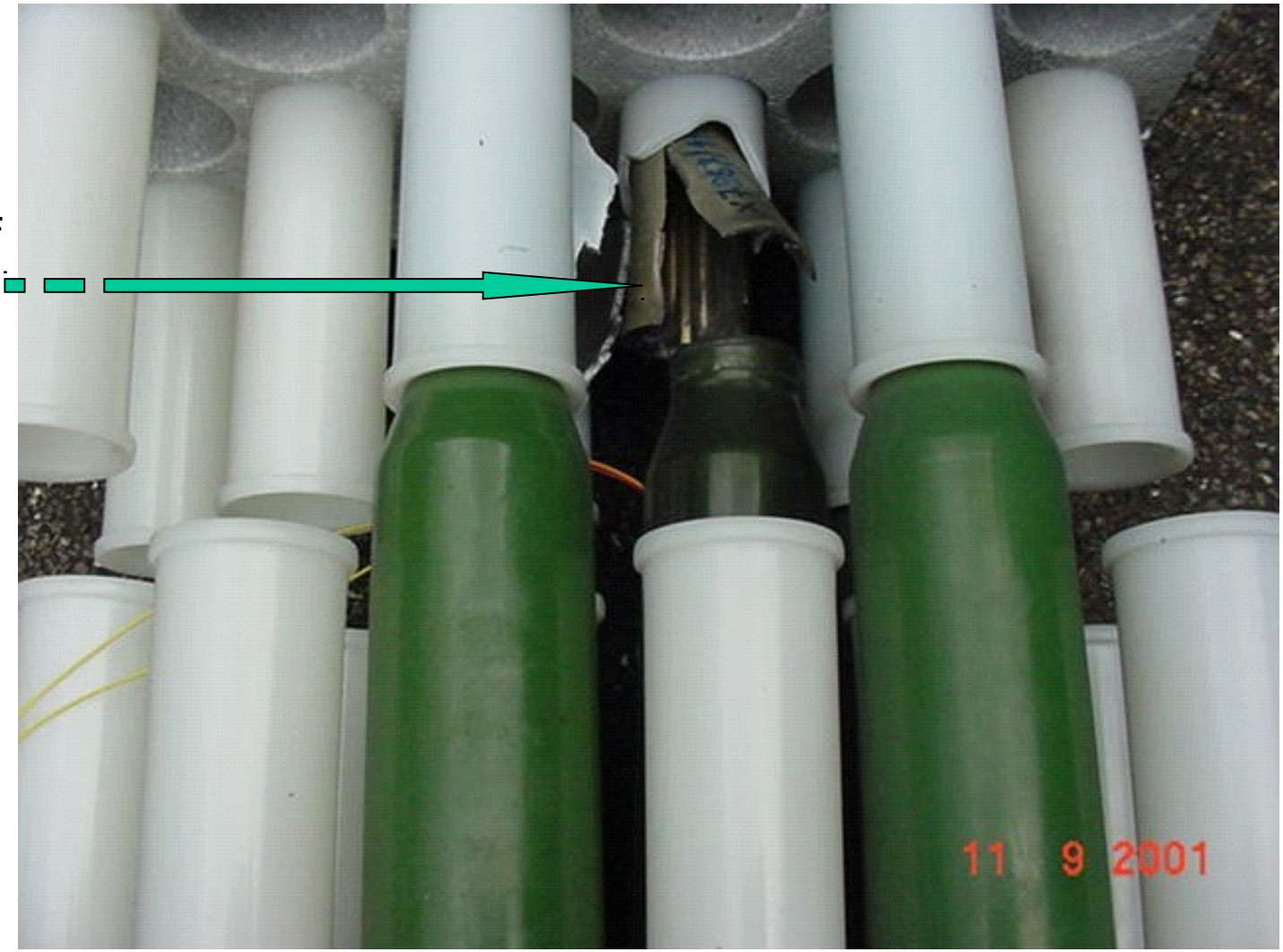
- 30 mm x 173/170 & 40 mm x 53 ABM in evaluation in several countries.

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.

35mm Ahead (ABM) KETF Detonation in Ammo Box

MAUSER OERLIKON

Ejection Charge (0.9 g HE) of One Round Detonated



Result:

no damage occurs to the other packed rounds and therefore no sympathetic detonation possible

We reserve all rights in connection with this document. Data, descriptions and graphics have only an information value. Modifications are reserved.